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**Title: Newspaper reporting and the emergence of charcoal burning suicide in Taiwan: A mixed methods approach**

**Authors:** Ying-Yeh Chen<sup>1,2</sup> M.D., Sc.D., Chi-Wei Tsai<sup>2</sup> M.S., Lucy Biddle<sup>3</sup> PhD, Thomas Niederkrotenthaler<sup>4</sup>, M.D., PhD, Kevin Chien-Chang Wu<sup>5,6\*</sup>, M.D., LL.M., Ph.D. David Gunnell<sup>3</sup> M.D., Ph.D.

<sup>1</sup> Taipei City Psychiatric Center, Taipei City Hospital, Taipei, Taiwan

<sup>2</sup> Institute of Public Health and Department of Public Health, National Yang-Ming University, Taipei, Taiwan

<sup>3</sup> School of Social and Community Medicine, University of Bristol, Bristol, UK

<sup>4</sup> Suicide Research Unit, Center for Public Health, Medical University of Vienna, Vienna, Austria

<sup>5</sup> Department and Graduate Institute of Medical Education and Bioethics, National Taiwan University College of Medicine, School of Medicine, Taipei, Taiwan

<sup>6</sup> Department of Psychiatry, National Taiwan University Hospital, Taipei, Taiwan

**Corresponding author:** Kevin Chien-Chang Wu

No.1 Changde Street, Zhongzheng Dist., Taipei City 10048, Taiwan

Tel: 886-2-23123456 # 66788, 88575

Fax: 886-2-2382-5646; 886-2-2393-5254

E-mail: [ccwu88@ntu.edu.tw](mailto:ccwu88@ntu.edu.tw)

## **Abstract**

### **Background:**

It has been suggested that extensive media reporting of charcoal burning suicide was a key factor in the rapid spread of this novel method in many East Asia countries. But very few empirical studies have explored the relationship between media reporting and the emergence of this new method of suicide.

### **Aims:**

We investigated the changing pattern of media reporting of charcoal burning suicides in Taiwan during 1998-2002 when this method of suicide increased most rapidly, assessing whether the characteristics of media reporting were associated with the changing incidence of suicide using this method.

### **Methods:**

A mixed method approach, combining quantitative and qualitative analysis of newspaper content during 1998-2002 was used. We compared differences in reporting characteristics before and after the rapid increase in charcoal burning suicide. Point-biserial and Pearson correlation coefficients were calculated to quantify the associations between the media item content and changes in suicide rates.

**Results:** During the period when charcoal burning suicide increased rapidly, the number of reports per suicide was considerably higher than during the early stage (30.7% vs. 10.3%). Detailed reporting of this new method was associated with a post-reporting increase in suicides using the method. Qualitative analysis of news items revealed that the content of reports of

suicide by charcoal burning changed gradually; in the early stages of the epidemic (1999-2000) there was convergence in the terminology used to report charcoal burning deaths, later reports gave detailed descriptions of the setting in which the death occurred (2001) and finally the method was glamourized and widely publicized (2001 to 2002).

**Limitations:**

**Conclusions:** Media reporting was associated with the evolution and establishment of charcoal burning suicide. Working with media and close monitoring of changes in the incidence of suicide using a new method might help prevent a suicide epidemic such as charcoal burning suicide seen in Taiwan.

**Key words:** charcoal burning suicide, media, mixed methods, acculturation, Taiwan

## Introduction

In less than 10 years, suicide by burning barbecue charcoal in a closed space increased from being a rarely used method of suicide to become the second most common method in Taiwan, accounting for approximately 30% of suicides by 2008-2010 (Chen et al., 2015). In many cities in Taiwan, the method is now the most common means of suicide (Lin et al., 2010). The rapid ‘uptake’ of the method was believed to be fueled by widespread media reporting and glamorization of the method as a painless, effective and peaceful method of suicide (Chen et al., 2013).

Media reporting of the first few cases of charcoal-burning suicides may have played an important role in the adoption of this method in Taiwan. In neighboring Hong Kong, the emergence of charcoal-burning suicide was believed to be associated with the extensive media reporting of a single case in September 1998 (Chung and Leung, 2001; Yip and Lee, 2007). The very first news report in Hong Kong described the method in detail; it was portrayed as a peaceful, painless, and effective way to end one’s life (Chan et al., 2005; Yip et al., 2010). Very few studies have examined how the media portrayed this new method when it first appeared in Taiwan and none have investigated whether characteristics of reporting were associated with the increase in incidence of suicides by charcoal burning (Chen et al., 2013). A recent Taiwanese study showed that the intensity (i.e. average number of reports per suicide) of newspaper reporting of charcoal-burning suicide was associated with the incidence of suicide by this method during 1998-2002 (Chen et al., 2013). This study however, didn’t consider qualitative aspects of the media reports or issues such as news content, size of the news articles or where the news item was placed. Based on a review of psychological models of suicide, Florentine and Crane (Florentine and Crane, 2010) indicated that ‘cognitive availability’, namely how accessible something is in one’s mind, could be an important factor influencing the choice of suicide method. They also suggested that the rapid

increase in charcoal-burning suicide could be an example of the media's influence on the 'cognitive availability' of a new suicide method in the general population, when media reports included detailed information of how the method could be employed. In contrast, although charcoal is readily available in western countries, charcoal-burning suicide is still very rare as it is not culturally associated with suicide. A more in-depth understanding of how the media established the 'cognitive availability' of a novel method of suicide in a society may potentially help inform the development of interventions to prevent future rapid uptake of new highly lethal methods of suicide.

The aims of the current study include 1) to document the evolution of newspaper presentations of charcoal burning suicide in Taiwan over time— from its first appearance in news articles in the late 1990s to its widespread and high profile coverage by 2002 and 2) to investigate whether the characteristics (e.g. glamorization, front page reporting) of newspaper reports of charcoal burning suicide affect the incidence of suicide using this method.

## **Methods:**

### *Design:*

A mixed methods approach combining quantitative and qualitative research methods was used. Newspaper articles on charcoal burning suicide in two leading National Taiwanese Daily newspapers – United Daily (UD) and China Times (CT) during 1998-2002 were retrieved. These two newspapers accounted for approximately 60% of newspaper sales in Taiwan during the study period. The content of all the reports was analyzed.

### *Data:*

Using online search tools, United Daily News Dataset (for UD), and Knowledge Media Winner (for CT), the news articles containing Chinese key words related to suicide (see appendix I) during 1998-2002 were searched in the headline (N=21143). Editorials, fictional stories, suicide terrorism, and educational articles were excluded. Leaving a total of 5554 suicide news reports. Articles were then read individually to identify those that reported charcoal burning suicide vs. other methods of suicide. Altogether 301 news reports (N=147 for UD, N=154 for CT) covering 260 charcoal burning suicide events were identified. Unless specified otherwise, our main unit of analysis is each report.

Data on suicide was obtained from official death records in Taiwan, following ICD-9 (International Classification of Disease) codes were used to identify suicide deaths: E950-959 (intentional self-harm) and E980-989 (intent undetermined, injury undetermined whether it is accidental or self-inflicted). Deaths certified as undetermined intent were also included because previous research indicates that many suicide deaths are likely to be classified into this category (Chang et al., 2010b). **We did a sensitivity analysis using certified suicides only (i.e. undetermined deaths excluded).** There is no specific code for charcoal-burning suicide under the ICD classification system. It was coded under E952 **(suicide and self-inflicted poisoning by other gases and vapors).** **The equivalent code for intent undetermined was E982 (poisoning by other gases undetermined whether accidentally or purposely inflicted).** Therefore, E952/E982 was used to denote charcoal-burning suicide in our analysis. It was estimated that approximately 90% of the suicide under E952/E982 was charcoal burning deaths (Lin et al., 2008).

### *Data analysis:*

### Quantitative content analysis:

A standard data extraction form was completed for each suicide report. The form included fields requesting information on characteristics of reporting which have been shown to be associated with an increase in suicides in previous research (Etzersdorfer et al., 2001; Hassan, 1995; Niederkrotenthaler et al., 2009b; Niederkrotenthaler et al., 2010; Sonneck et al., 1994) i.e.

- 1) Prominence of the report: a. front page vs. elsewhere, b. page size, c. use of photographs, and d. description of the method in the headline.
- 2) Glamorization of the method: the method was described as a. peaceful, b. being able to maintain the appearance/intactness of the body, c. beautiful looking/face turned rosy, d. painless, e. effective/lethal.
- 3) Details of the method described: a. sealed a room, b. burned charcoal in a small space (bathroom, car, etc.), c. co-ingestion of hypnotics or alcohol, d. other technical details.
- 4) Whether financial problems or unemployment was portrayed as a precipitating factor.
- 5) How the factors contributing to the death were presented (single factor or multiple factors) and whether mental disorders contribute.
- 6) Whether the report concerned a single suicide, a suicide pact or a homicide-suicide.
- 7) Whether injury to others (e.g. from a house fire) was reported.
- 8) News item focus: attempted suicide or completed suicide.

Additionally, we calculated reporting intensity (average number of reports per suicide) and repetitive reporting (number of reports concerning the same event). The data were extracted from the news reports by a single researcher (C-WT). To improve the quality and consistency of data extraction, three authors (Y-YC, C-WT, KC-CW) initially jointly extracted data from 20 randomly selected news reports and coded these articles independently. Discrepancies were discussed and refined until all three authors reached consensus on approaches to categorization. Tsai then completed the coding of the whole 301 articles.



We used Joinpoint regression analysis (National Cancer Institute, 2012) on monthly suicide count data to identify when the onset of the rapid rise in charcoal burning suicides occurred and when it plateaued. The characteristics of newspaper reports of charcoal burning suicide following their first appearance up to the month when the incidence of charcoal burning suicide rapidly increased were compared. Point-biserial (for dichotomized reporting variables) and Pearson (for continuous reporting variables) correlation coefficients were calculated to quantify the associations between repetitive reporting (number of reports describing the same event), characteristics of the reporting (prominence of the news items, glamorization of the method, detailed description of the method) and the differences in suicide rates before and after the appearance of the news items (post publication suicide rates minus pre-publication suicide rates). The difference in suicide rates before and after the appearance of the news item was defined as the change between the suicide rates (suicide per 100000 population) in the period preceding the publication date and in the week after publication. Specifically, days -14 to -8 (where day 0 marks the publication date) were defined as the pre-publication period and days 0 to 6 were the corresponding post-publication period. The week immediately preceding the publication date was not used because other media sources (e.g. television or internet) may have reported the suicidal event slightly earlier than the newspapers and influenced the incidence of suicide. Excluding the week immediately preceding the publication date could hence eliminate the contamination effect. This approach has been used in other studies (Niederkrotenthaler et al., 2010; Pirkis et al., 2006).

#### Qualitative analysis of reporting characteristics:

We randomly selected 20 news items from the identified 301 newspaper articles on charcoal burning suicide. News items were read, re-read and analyzed by Y-YC, C-WT, LB and DG. By

repetitive perusal and consideration, a list of coding themes were constructed (Appendix II). We Y-YC and C-WT then adopted the coding themes to code the data throughout the whole 301 newspaper items. A qualitative interpretive approach was taken, combining thematic analysis with comparison between two coders (Glaser and Strauss, 1967; Green and Thorogood, 2004). Coding disagreements between Chen and Tsai that could not be resolved were referred to another researcher (KC-CW) who analyzed those blinded to the codes assigned to them by Chen and Tsai. In most cases this resolved and discussed the rationale for their coding until agreement was reached. The coding was regularly discussed to come up with the final interpretation of the results.

## **Results:**

### Quantitative analysis:

Newspaper reporting of charcoal burning suicide during 1998-2002 is summarized in table 1. Throughout the study period, there were no front page stories, 13 items (4.3%) were accompanied with a photo, and five items (1.7%) mentioned that the method gave a beautiful looking (pink color) to the skin. Details of how to implement the method, such as sealing a small space, use of alcohol or hypnotics together with charcoal burning, was described in more than half of the news items (N=163, 54.2%). Only 11 items (3.7%) described psychiatric illness as a precipitating factor to the suicide; economic difficulty was the most common precipitating factor mentioned (41.2%). Although cases involving multiple deaths (e.g. suicide pacts, homicide-suicide) are unusual (Eliason, 2009), more than one quarter of news items on charcoal burning suicide reported such deaths. In total, 260 suicide events were reported, 176 events were reported

once (67.7%), 71 events were reported twice (27.3%) (these events were reported once by UD and once by CT), 10 events were reported three times (3.8%) and 3 events were reported four times (1.2%). Only 5% of the events were reported by the same newspaper more than once.

Joinpoint regression analysis identified June 2001 as the point of onset of the epidemic and July 2002 as the point that the rise of the epidemic stabilized (Figure 1). Figure 1 shows that during the period of rapid rise in charcoal burning suicide, the number of newspaper reports per suicide (reporting intensity) rises correspondingly. In addition, several larger sized reports and reports that glamorized the method were observed during this period.

The reporting characteristics between the initial stage and the rapid rising stage of the suicide epidemic were compared using chi-squared test (Table 2). The reporting intensity in rapid rising stage was significantly greater than the initial stage ( $P < .0001$ ).

Correlation coefficients for news reporting patterns and post-reporting increase in suicide rates are displayed in table 3. News items that described details of the method were positively and significantly correlated with post-publication increase in suicide rates. Other characteristics such as significance of the news items and glamorization of the method were not related to post reporting increase in suicide rates. **A sensitivity analysis using only certified suicides produced very similar findings (Appendix III).**

#### Qualitative analysis of reporting characteristics

Through qualitative thematic analysis, we examined changes in themes over time in order to define various periods of reporting. Three key phases in the style of reporting charcoal burning suicide in the 5 year period were identified--

**Phase I:** Consolidation of terminology and mechanism (1999-2000) – at the very beginning of the charcoal burning epidemic, several different phrases were used to describe this method, such as “we observed a phenomenon that charcoals were on fire”, “burned coal to end one’s life”, “burned wood charcoal as a way to cut life short”, “burned charcoal to produce carbon *dioxide*, this could lead to a state of coma and then death”. In addition, the lethal mechanism was not well known, many reports described the mechanism as “carbon dioxide poisoning” or “the death was due to inhalation of toxic smoke”.

The term “charcoal burning suicide” gradually became a dominant way to describe this suicide method in 2000, but it was not until the end of 2001 that all reports were consistent with the terminology –charcoal burning and also the mechanism of death (i.e. carbon monoxide poisoning) was correctly reported in all reports. To sum up, the term --“charcoal burning suicide” was already established towards the end of phase one, and was further consolidated at the beginning of phase two. Until end of 2001, there is no need to mention “charcoal burning *suicide*” “charcoal burning” per se indicates a suicide.

**Phase II:** Detailed description of the suicide scene (2001): Before the mid-2001, news reports did not pay much attention to the description of the setting for charcoal burning suicide; it was described roughly — such as “burned charcoal in bathroom ” “burned charcoal in the room”, etc.. After mid-2001, the descriptions became more detailed, for example “he *sealed* all the windows and doors” “the bathroom windows were closed, a pan with charcoal was placed next to the bed”. These descriptions clearly indicate the items an individual needs to obtain and the place you have to set up (i.e. enclosed room, sealed door/windows) for suicide.

**Phase III:** Several ‘Special features’ make charcoal burning stand out as an appealing method of suicide (second half of 2001 to 2002): Our qualitative analysis reveals that the change in quantities of reports after the second half 2001 was accompanied by a change in the description of the method. The method was no longer described as a ‘new’ or “not well known” method of suicide; “positive” elements, including the glamorization of the method and the possibility of dying with loved ones (i.e. suicide pact, filicide-suicide) were incorporated to the reporting. For example, ‘the appearance looked peaceful and it was like he/she is sleeping’ and ‘the skin color turned rosy’. The potential of dying with beloved ones is a further ‘advantage’ mentioned in the news media during the period. For example, “lovers went to a hotel together and burned charcoal to kill themselves. It was suspected that their careers did not go well and their love was not blessed, so they decided to go hand in hand to the Yellow Fountain (“Yellow Fountain” in Chinese means death, but in a romantic/poetic way). “.....leaving naught but charred ashes and heavy hearts, mother and son died together, one died and one is still in a coma”; “Burned charcoal in a closed room, mother and her two children died on a bed together”.

One further feature of the reporting in this stage is the depiction of the suicidal process in a very dynamic way so that the whole suicide circumstances were presented with vivid mental images through reporters’ descriptions. For example, “She locked herself in the bathroom. The cracks between doors and windows were completely sealed with towel. A pan with charcoal ashes was found next to her.” “Mother and the daughter, with the company of each other, they first took hypnotics in the 3<sup>rd</sup> floor bedroom, and then went down together to the second floor bedroom to burn charcoal and eventually died by carbon monoxide poisoning.... In order to consume oxygen as soon as possible, the cracks in doors and windows were sealed tightly with towels“. The description during the period has transformed from a more fragmented reporting to

providing a thorough and lively mental image of how the whole suicidal process was prepared, proceeded and completed. This transformation in reporting style could be influential in the dissemination of this new method of suicide.

## **Discussion**

### *Main Findings*

We found evidence of changes in the reporting of charcoal burning suicide as the use of this method increased in Taiwan. In our quantitative content analysis, we found that in the early stage of the suicide epidemic, the reporting intensity of this new suicide method was significantly lower than that in the rapid rising stage. Furthermore, compared to the early phase of the epidemic, during the rapid rising stage a higher proportion of reports included descriptions of the method in their title, glamourized the method or described the use of hypnotics or alcohol together with burning charcoal. These differences were not statistically significant, however a significant rise in suicides was found following newspaper articles reporting a suicide with detailed description of the method.

Our qualitative analyses of reporting characteristics resonate with the findings from quantitative content analysis that the reporting of charcoal burning suicide evolved over time and that the changing patterns of reporting reflected the process of dissemination of this new method of suicide in Taiwan. In the very early phase (1999-2000), the method was not well known and the mechanism of dying was not clear; the content of the reporting in this stage reflected a process of getting a specific name for this new suicide phenomenon. And after the establishment of the terminology, the news focus switched to detailing the settings where this new method was used. Lastly, many appealing features, such as peacefulness of the method and being able to die

with loved ones, were added to the news articles. All these reporting elements may have helped increase the cognitive availability of the new method in Taiwan.

### *Strengths and Limitations*

Although several studies have explored the rise in charcoal burning suicides in the past decade, and it is believed that the media plays a key role in this regard (Chang et al., 2014; Chang et al., 2010a; Chen et al., 2015; Thomas et al., 2011), few have examined changing patterns of media reporting while this method became established. Using an analysis of newspaper content, our study provides empirical evidence on the ‘acculturation’ process of a new method of suicide. Our mixed methods approach not only elucidates how news reports on charcoal burning suicide construct the meanings and narratives for the practice by first giving its name, but also explores how media representations as cultural artefacts might spread the practice by encoding population imagination and enhancing cognitive availability. The approach extracts the best parts of both qualitative and quantitative information from the research materials (Creswell, 2014) and thus this article provides valuable insights for policy makers in their response to the emergence of new methods.

Current findings should be interpreted in light of the following limitations. First, we focused on the analysis of newspaper content, other types of media such as TV and internet were not considered. However, during our study period -- 1998-2002, household internet access rate was less than 50% in Taiwan (Institute for Information Industry, 2013); traditional media still play a central role in the dissemination of information during the period. In addition, newspaper can be saved and re-read, previous studies tended to find that suicide modelling effect was stronger for newspaper stories comparing to TV reporting (Stack, 2003). Second, there is no specific code for

charcoal burning suicide in the ICD system; we were not able to differentiate charcoal-burning suicides from deaths using other sources of non-domestic gas, such as car exhaust fumes or hydrogen sulfide. However, one previous study indicates that charcoal-burning suicide accounted for over 90% of all suicides from non-domestic gas poisoning in Taiwan (Lin et al., 2008); this limitation will not have a major impact on our analysis. Third, during 1998-2002, there were three major newspapers in Taiwan – United Daily (UD), China Times (CT) and Liberty Times (LT), each accounted for about 30-40% of newspaper sales. However, the electronic archives of LT did not cover the study period. To assess possible bias from the exclusion of this paper, we randomly selected two months in each study year and hand searched the newspaper archives to investigate the concordance of suicide reporting in LT with UD and CT. The reporting of charcoal burning suicides in the LT was lower than the other two daily newspapers. In the two months selected in 2001, we identified a total of ten news items on charcoal burning suicide in UD, seven in CT and only one in LT. In the two months in 2002, 23 news items on charcoal burning suicide were identified in UD and 19 in CT, but only three in LT, indicating the reporting frequency of charcoal burning suicide in LT was much lower than in the other two newspapers. Analysis of news reporting in UD and CT in our paper is quite representative of the reporting of charcoal burning suicide in Taiwan during the study period. Lastly, there is no accurate newspaper circulation data available for all the newspapers in Taiwan; data on newspaper sales were estimated by sampling survey. It should be recognized that the estimated impact of news reporting did not consider newspaper sales.

#### *Interpretation and Comparison with previous studies*

Based on our analysis, during 1998-2002, there was no front page suicide stories, very few news items contained photos, no celebrity suicides were reported, there was not much repetitive



reporting in the two newspapers and the page size was generally small (97% news items were less than 1/8 page). The absence of front page reports is unusual; Phillips (1974) identified 34 front page reports over a 21 year period in the US (Phillips, 1974) and in a study of newspaper reporting in Austria over a 6 month period in 2005, Niederkrotenthaler identified 16 front page stories (3% of all reports) (Niederkrotenthaler et al., 2010). The key differences in reporting style between ‘initial stage’ and ‘rapid increase stage’ was reporting intensity, in other words, the rapid increase in charcoal burning suicide in Taiwan seems to be related to the intensive reporting of the new method. According to one previous study conducted in 2009, approximately 1 out of 10 suicides was reported in Taiwanese newspaper (Chen et al., 2012); this figure was the same as the reporting intensity of charcoal burning suicide in the ‘initial stage’ during Jan. 1998-May 2001. However, during the ‘rapid increase stage’ of charcoal burning suicide, more than 30% of deaths by this new method were reported; the reporting intensity for non-charcoal burning suicide was estimated to be 28% in the same period (Chen et al., 2013). This indicates a generalized increase in media attention to suicide stories, with a slightly stronger interest in the novel method during the period. This is in accordance with previous studies that suicides involve unusual methods or circumstances are the key elements of newsworthiness, making them attractive news subjects which tend to be over-reported (Niederkrotenthaler et al., 2009a; Pirkis et al., 2007).

Previous studies from Taiwan suggest that the media’s impact on suicide rates is method-specific. Newspaper reporting of, and/or internet search for, non-charcoal burning suicide (such as hanging, poisoning) were not associated with an increase in non-charcoal burning suicide incidence; however, the reporting of charcoal burning suicide in the print media and/or the increase in internet search for charcoal burning method were related to an increase in the

incidence of charcoal burning suicides (Chang et al., 2015; Chen et al., 2013).

Charcoal burning suicide has spread from Hong Kong and Taiwan to several neighboring East Asian countries in the past decade (Chang et al., 2014). The spread of charcoal burning suicide after 2008 in South Korea was known to be related to the extensive media reporting of a Korean celebrity who died by charcoal burning suicide (Lee et al., 2014). The death of the celebrity triggered extensive newspaper reporting and internet searches for charcoal burning suicide and was positively associated with a subsequent rise in charcoal burning suicide in South Korea (Lee et al., 2014). Establishing a media monitoring system that identifies reporting of a novel method and triggers discussions / meetings with news editors is a potentially important suicide prevention measure; this way, timely feedback to media professionals can be provided and hopefully the reporting intensity associated with a new method of suicide can be controlled.

Our qualitative analysis of newspaper content provided more detailed information on the changing nature of reporting of charcoal burning suicide over the course of its increasing use in the community. This process began with reporters coining a name for the method to differentiate its use for suicide from its usual function (i.e. outdoor barbecue vs. indoor suicide), continued by detailing the settings where the method could be used effectively and then highlighting its uniqueness; it is through these processes that charcoal burning suicide finally becomes a widely acceptable / cognitively available method of suicide. Through this “educational process” of media reporting, the method was once ‘unknown’ and ‘complicated’ but then gradually became ‘well-known’, ‘doable’ and appealing. “Charcoal” has always been widely available in Taiwan, the increase in charcoal burning suicide was not related to the changes in the physical availability of barbecue charcoal. It is the successive increase in ‘cognitive availability’ of this method that leads to the suicide epidemic (Florentine and Crane, 2010). Taking charcoal burning suicide as

an innovation in suicide technology, results of the above media content analyses actually strengthen the theory of innovation diffusion adopted in a previous paper by some of the co-authors (Chen et al., 2015). The construction of narrative meanings and imaginations for potential users of charcoal burning suicide may propagate, root the suicide practices and finally make it part of Taiwanese culture and continue to be one of the popular methods of suicide in Taiwan.

It is notable that detailed description of this method was associated with a subsequent increase in charcoal burning suicides during our study period, 1998-2002. Charcoal burning suicide requires some planning and attention to technical details (Tsai et al., 2011). Hence, details of the method that were included in news articles may have served as an important source of information to potentially vulnerable people. This provides justification for the inclusion of advice against reporting of technical details of suicide methods in media guidelines.

## **Conclusions**

Media reporting of charcoal burning suicide changed during the course of the emergence of the charcoal burning epidemic in Taiwan. The increasing ‘cognitive availability’ of charcoal burning suicide was not informed by one single high impact article or influenced by the suicide of a celebrity. It was a progressive process that took several years to become ‘rooted’ in the population imagination. To avoid intensive reporting and detailed descriptions of a new method in news articles is a potentially important means of preventing the spread of a novel suicide method. Working with media and close monitoring of changes in the incidence of suicide using a new method might help prevent a suicide epidemic such as charcoal burning suicide seen in Taiwan.

## References

- Chan, K.P., Yip, P.S.F., Au, J., Lee, D.T., 2005. Charcoal-burning suicide in post-transition Hong Kong. *Br J Psychiatry* 186, 67-73.
- Chang, S.S., Chen, Y.Y., Yip, P.S.F., Lee, W.J., Hagihara, A., Gunnell, D., 2014. Regional changes in charcoal-burning suicide rates in East/Southeast Asia from 1995 to 2011: a time trend analysis. *PLoS Med* 11, e1001622.
- Chang, S.S., Gunnell, D., Wheeler, B.W., Yip, P.S.F., Sterne, J.A., 2010a. The evolution of the epidemic of charcoal-burning suicide in Taiwan: a spatial and temporal analysis. *PLoS Med* 7, e1000212.
- Chang, S.S., Kwok, S.S., Cheng, Q., Yip, P.S., Chen, Y.Y., 2015. The association of trends in charcoal-burning suicide with Google search and newspaper reporting in Taiwan: a time series analysis. *Soc Psychiatry Psychiatr Epidemiol* 50, 1451-1461.
- Chang, S.S., Sterne, J.A., Lu, T.H., Gunnell, D., 2010b. 'Hidden' suicides amongst deaths certified as undetermined intent, accident by pesticide poisoning and accident by suffocation in Taiwan. *Soc Psychiatry Psychiatr Epidemiol* 45, 143-152.
- Chen, Y.Y., Chen, F., Gunnell, D., Yip, P.S.F., 2013. The impact of media reporting on the emergence of charcoal burning suicide in Taiwan. *PLoS One* 8, e55000.
- Chen, Y.Y., Yip, P.S.F., Lee, C.K., Gunnell, D., Wu, K.C., 2015. The diffusion of a new method of suicide: charcoal-burning suicide in Hong Kong and Taiwan. *Soc Psychiatry Psychiatr Epidemiol* 50, 227-236.
- Chen, Y.Y., Yip, P.S.F., Tsai, C.W., Fan, H.F., 2012. Media representation of gender patterns of suicide in Taiwan. *Crisis* 33, 144-150.

- Chung, W.S., Leung, C.M., 2001. Carbon monoxide poisoning as a new method of suicide in Hong Kong. *Psychiatr Serv* 52, 836-837.
- Creswell, J.W., 2014. *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications, London.
- Eliason, S., 2009. Murder-suicide: a review of the recent literature. *J Am Acad Psychiatry Law* 37, 371-376.
- Etzersdorfer, E., Voracek, M., Sonneck, G., 2001. A dose-response relationship of imitational suicides with newspaper distribution. *Aust N Z J Psychiatry* 35, 251.
- Florentine, J.B., Crane, C., 2010. Suicide prevention by limiting access to methods: a review of theory and practice. *Soc Sci Med* 70, 1626-1632.
- Glaser, B., Strauss, A., 1967. *The Discovery of Grounded Theory*. Aldine Publishing, New York.
- Green, J., Thorogood, N., 2004. *Qualitative Methods for Health Research*. SAGE, London.
- Hassan, R., 1995. Effects of newspaper stories on the incidence of suicide in Australia: a research note. *Aust N Z J Psychiatry* 29, 480-483.
- Institute for Information Industry, 2013. 2012 Taiwan household survey of the use and need for broadband. Institute for Information Industry. (in Chinese), Taipei, Taiwan.
- Lee, A.R., Ahn, M.H., Lee, T.Y., Park, S., Hong, J.P., 2014. Rapid spread of suicide by charcoal burning from 2007 to 2011 in Korea. *Psychiatry Res*.
- Lin, J.J., Chang, S.S., Lu, T.H., 2010. The leading methods of suicide in Taiwan, 2002-2008. *BMC Public Health* 10, 480.
- Lin, J.J., Chen, L.H., Huang, S.M., Lu, T.H., 2008. Problems in estimating the number of suicides by charcoal burning in Taiwan. *J Epidemiol Community Health* 62, 566.

National Cancer Institute, 2012. Surveillance research. Joinpoint trend analysis software.

<http://surveillance.cancer.gov/joinpoint/>.

Niederkrötenhaller, T., Till, B., Herberth, A., Voracek, M., Kapusta, N.D., Etzersdorfer, E., Strauss, M., Sonneck, G., 2009a. The gap between suicide characteristics in the print media and in the population. *Eur J Public Health* 19, 361-364.

Niederkrötenhaller, T., Till, B., Kapusta, N.D., Voracek, M., Dervic, K., Sonneck, G., 2009b. Copycat effects after media reports on suicide: a population-based ecologic study. *Soc Sci Med* 69, 1085-1090.

Niederkrötenhaller, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., Eisenwort, B., Sonneck, G., 2010. Role of media reports in completed and prevented suicide: Werther v. Papageno effects. *Br J Psychiatry* 197, 234-243.

Phillips, D.P., 1974. The influence of suggestion on suicide: substantive and theoretical implications of the Werther effect. *Am Sociol Rev* 39, 340-354.

Pirkis, J., Burgess, P., Blood, R.W., Francis, C., 2007. The newsworthiness of suicide. *Suicide Life Threat Behav* 37, 278-283.

Pirkis, J., Burgess, P.M., Francis, C., Blood, R.W., Jolley, D.J., 2006. The relationship between media reporting of suicide and actual suicide in Australia. *Soc Sci Med* 62, 2874-2886.

Sonneck, G., Etzersdorfer, E., Nagel-Kuess, S., 1994. Imitative suicide on the Viennese subway. *Soc Sci Med* 38, 453-457.

Stack, S., 2003. Media coverage as a risk factor in suicide. *J Epidemiol Community Health* 57, 238-240.

Thomas, K., Chang, S.S., Gunnell, D., 2011. Suicide epidemics: the impact of newly emerging methods on overall suicide rates - a time trends study. *BMC Public Health* 11, 314.

Tsai, C.W., Gunnell, D., Chou, Y.H., Kuo, C.J., Lee, M.B., Chen, Y.Y., 2011. Why do people choose charcoal burning as a method of suicide? An interview based study of survivors in Taiwan. *J Affect Disord.* 131, 402-407.

Yip, P.S.F., Law, C.K., Fu, K.W., Law, Y.W., Wong, P.W., Xu, Y., 2010. Restricting the means of suicide by charcoal burning. *Br J Psychiatry* 196, 241-242.

Yip, P.S.F., Lee, D.T.S., 2007. Charcoal-burning suicides and strategies for prevention. *Crisis* 28 (suppl 1), 21-27.

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Ethics statement: Because no personal data were involved, this study was exempted from ethical review by the Human Research Ethics Committee, Taipei City Hospital, Taiwan



## Appendix I

### Chinese keywords of suicide

自殺(suicide)、自縊(hang oneself)、自戕(self-harm)、尋短(literally the terms says --seek for shortcut; but it means suicide)、跳樓(jumping from high rise building)、自焚(self-immolation)、仰藥(medication overdose)、燒炭(charcoal burning)、上吊(hanging)、臥軌(lying on the railway)、開瓦斯(using domestic gas to suicide)、飲彈(firearm suicide)、跳橋(bridge jumping)、自盡(literally the terms says – give one's own life a dead end; it means suicide)、割腕(wrist cutting)、投縋(literally the terms says – throw yourself to a rope, this means suicide by hanging)、投水(drowning suicide)、喝農藥(pesticide poisoning)、跳海(suicide by jumping into the ocean)、厭世(literally it says fed up with the world, a equivalent term of suicide)、切腹(harakiri)、服毒(poisoning suicide)、輕生(literally it means look down upon one's life, it means suicide)、死諫(death protest)、想不開(literally it means being trapped within one's thought, it is regarded as an equivalent term of suicide)、割脈(vessel cutting, equivalent to wrist cutting)

## Appendix II:

### Coding Themes

#### 1. Description of the method :

a) Detailed description of technique: close windows, seal the room, small space (e.g. explicitly describe a small space making it easier to create CO chamber or just describe the place of suicide such as bathroom; car).

b) Vague descriptions about implementation of the method that do not give precise information about how to implement it e.g. “deliberately isolated himself/herself”, “burn charcoal when classmates were all out during summer vacation”.

c) description of mechanism (e.g. burning charcoal to induce carbon monoxide poisoning)/process of death (e.g. fall into coma).

Note: *how* death occur is an important factor in choice of suicide method

d) General impression of the method: e.g. clean, peaceful, swollen body, require courage, maintain the appearance of the body, or bad/unpleasant images (e.g. black smoke, bad smell).

#### 2. Precipitating factors (should consider whose explanation i.e. neighbor / friend / family)

— a) indebtedness, b) unemployment, c), medical disease, d) psychiatric disorder, e) academic stress, f) work stress, g) relationship problem, h) family conflict, i) victim of crime/injustice, j) general pressure.

#### 3. Single suicide vs. non-single suicide (e.g. suicide pact, homicide-suicide).

4. The consequence of suicide — a) how and whether sequelae of charcoal burning suicide were reported, b) the results/function of suicide (e.g. lead to the change of system or family relations, etc.).
5. Inconsistent suicide risk perception between observers (unpredictable vs. predictable) : e.g. risk perception differed between classmates and family members.
6. Information source for the story—police? Neighbors? Friends? Family members?
7. General impression of the suicide story: a) success story vs. suicide (e.g. the death of a famous HK billionaire, a NTU graduate), b) that the suicide is understandable, c) sympathy for the deceased or making the deceased out to be a bad person, d) surprising, strange, not understandable.
8. Content of death note.
9. Indication that survivors of the method may be permanently damaged / negative information about the method.
10. Indication that use of the method poses risks to others?
11. Discovery of the body (who found the body? And how/ why they came to do so, description of circumstances).
12. Whether homicide was considered.
13. Whether alternative method was considered by the deceased.

Note: Need to observe the change of description patterns over time — e.g. in early stage of the epidemic, traces of charcoal found in suicide scene was not directly linked to suicide, but the association between charcoal and suicide was established later on; different terms were used to describe charcoal burning suicide in the early stage, but the terminology was consolidated later.

### Appendix III:

Supplementary Table: Bivariate associations between news reporting patterns and post-report change in suicide rates (using certified suicide cases)

Newspaper reporting of charcoal burning suicide	N(%)	r <sup>a</sup>	p
<b>Prominence of the news items</b>			
Page size *		0.06	0.29
Presence of photos	13 ( 4.3)	-0.05	0.43
Method described in the headline	173 (57.5)	-0.05	0.35
<b>Glamorization of charcoal burning suicide</b>			
Beautiful-looking (face turns pink)	6 ( 2.0)	0.04	0.45
Effective and lethal	5 ( 1.6)	0.02	0.67
	1 ( 0.3)	0.05	0.36
<b>Details of method described</b>			
	163 (54.2)	0.18	0.00
Describe a sealed chamber (sealed a room)	81 (26.9)	0.14	0.01
Describe a small space (car, bathroom)	76 (25.2)	0.05	0.35
Describe taking hypnotics/alcohol	27 ( 9.0)	0.12	0.03
Other technical detail	18 ( 6.0)	0.08	0.18
<b>News item focus</b>			
Completed suicide	244 (81.1)	0.00	0.99
Attempted suicide (suicidal behaviors not leading to death)	46 (15.3)	0.04	0.50
Other	11 ( 3.7)	-0.08	0.19
<b>Repetitive reporting</b> <sup>#</sup> (number of reports described the same event)	84 (32.3)	0.00	0.99

\*Pearson correlation coefficient was presented, page size was modeled as ordinal variable:  $\leq 1/8$ ,  $1/4$  to  $1/8$  and larger than  $1/4$

# A total of 260 suicide cases were reported, 84 cases were reported for more than once

Table1: Analysis of newspaper content on charcoal burning suicide, 1998-2002 in Taiwan

Newspaper reporting of charcoal burning suicide	N=301 N (%)
<b>Prominence of the report</b>	
Front page	0 ( 0.0)
Page size	
> 1/2	0 ( 0.0)
$1/2 \geq X > 1/4$	2 ( 0.7)
$1/4 \geq X > 1/8$	6 ( 2.0)
$\leq 1/8$	293 (97.3)
Presence of photos	13 ( 4.3)
Method described in the headline	173 (57.5)
<b>Glamorization of charcoal burning suicide</b>	6 ( 2.0)
Peaceful	0 ( 0.0)
Maintain the appearance/intactness of the body	0 ( 0.0)
Beautiful-looking/face turned rosy	5 ( 1.7)
Painless	0 ( 0.0)
Effective and lethal	1 ( 0.3)
<b>Details of method described</b>	163 (54.2)
Describe a sealed chamber (sealed a room)	81 (26.9)
Describe a small space (car, bathroom)	76 (25.2)
Describe taking hypnotics/alcohol	27 ( 9.0)
Other technical detail	18 ( 6.0)
<b>Precipitating events</b>	
Whether precipitating events were related to financial problems or unemployment	125 (41.5)
Number of precipitating events and relatedness to mental illness	169 (56.2)
Single factor— psychiatric illness was not mentioned	5 ( 1.7)
Single factor — psychiatric illness	6 ( 2.0)
Multiple factors— psychiatric disease included	64 (21.3)
Multiple factors— psychiatric illness was not mentioned	57 (18.9)
Unknown/not reported	
<b>Number of cases reported</b>	
Single case	223 (74.1)
Two or more cases	78 (25.9)
Filicide suicide	37 (12.3)
Maternal filicide suicide	23 ( 7.6)
Paternal filicide suicide	12 ( 4.0)
Both parents and their children	2 ( 0.7)
Suicide Pact	35 (11.6)
Homicide suicide	4 ( 1.3)
Other <sup>a</sup>	2 ( 0.7)
<b>Possibility of harm to others</b>	3 ( 1.0)

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<b>News item focus</b>	
Completed suicide	244 (81.1)
Attempted suicide (suicidal behaviors not leading to death)	46 (15.3)
Other <sup>b</sup>	11 ( 3.7)

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<sup>a</sup>one news item described an event combined suicide pact and homicide-suicide, one news item was difficult to judge whether it was a suicide pact or homicide-suicide

<sup>b</sup> 11news items contained more than one case, 8 reported suicide pact, some cases died and some survived in the same incident. 3 reported several independent suicide events in the same news item.

Table 2: Analysis of newspaper content on charcoal burning suicide in different periods of time during 1998-2002 in Taiwan

Newspaper reporting of charcoal burning suicide	All period (1998~2002)	Initial stage (Jan. 1998-May 2001)	Rapid increase (June 2001-July 2002)	Initial vs. Rapid increase
	N=301 N (%)	N=27 N(%)	N=207 N(%)	P value
<b>Prominence of the news items</b>				
Page size				0.93
> 1/8	8 ( 2.7)	1 (3.7)	7 ( 3.4)	
≤ 1/8	293 (97.3)	26 (96.3)	200(96.6)	
Presence of photos	13 ( 4.3)	2 (7.4)	10 ( 4.8)	0.57
Method described in the headline	173 (57.5)	13(48.1)	126 (60.9)	0.21
<b>Glamorization of charcoal burning suicide</b>	6 ( 2.0)	0 ( 0.0)	6 ( 2.9)	0.37
Beautiful-looking (face turns pink)	5 ( 1.6)	0 ( 0.0)	5 ( 2.4)	0.41
Effective and lethal	1 ( 0.3)	0 ( 0.0)	1 ( 0.5)	0.71
<b>Details of method described</b>	163 (54.2)	14 (51.9)	113 (54.6)	0.79
Describe a sealed chamber (sealed a room)	81 (26.9)	9 (33.3)	58 (28.0)	0.57
Describe a small space (car, bathroom)	76 (25.2)	7 (25.9)	51 (24.6)	0.88
Describe taking hypnotics/alcohol	27 ( 9.0)	0 ( 0.0)	22 (10.6)	0.08
Other technical detail	18 ( 6.0)	1 ( 3.7)	8 ( 3.9)	0.97
<b>Reporting Intensity*</b>	0.25	0.10	0.31	<.0001

\*Reporting Intensity: average number of reports per suicide



Table 3: Bivariate associations between news reporting patterns and post-report change in suicide rates

Newspaper reporting of charcoal burning suicide	N(%)	r <sup>a</sup>	p
<b>Prominence of the news items</b>			
Page size *		0.02	0.71
Presence of photos	13 ( 4.3)	-0.03	0.61
Method described in the headline	173 (57.5)	0.01	0.91
<b>Glamorization of charcoal burning suicide</b>			
Beautiful-looking (face turns pink)	5 ( 1.6)	0.06	0.27
Effective and lethal	1 ( 0.3)	0.04	0.48
<b>Details of method described</b>			
	163 (54.2)	0.15	0.01
Describe a sealed chamber (sealed a room)	81 (26.9)	0.09	0.12
Describe a small space (car, bathroom)	76 (25.2)	0.09	0.14
Describe taking hypnotics/alcohol	27 ( 9.0)	0.07	0.20
Other technical detail	18 ( 6.0)	0.05	0.35
<b>News item focus</b>			
Completed suicide	244 (81.1)	-0.00	0.94
Attempted suicide (suicidal behaviors not leading to death)	46 (15.3)	0.01	0.81
Other	11 ( 3.7)	-0.02	0.76
<b>Repetitive reporting</b> <sup>#</sup> (number of reports described the same event)	84 (32.3)	-0.09	0.16

\*Pearson correlation coefficient was presented, page size was modeled as ordinal variable:  $\leq 1/8$ ,  $1/4$  to  $1/8$  and larger than  $1/4$

# A total of 260 suicide cases were reported, 84 cases were reported for more than once

Figure 1: Number of charcoal burning suicides and Number of reports per suicide of charcoal burning suicide, key reporting characteristics are identified, 1998-2002

